Saskatchewan
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SPATIAL PATTERNS OF SASKATCHEWAN'S MEAN ANNUAL PRECIPITATION

(1951-1980)

by

V. Wittrock
with
E. Wheaton

SRC Technical Report No. 229

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ABSTRACT

Saskatchewan's precipitation remains a popular topic especially with the droughts of recent years. This report includes an examination and discussion of the average precipitation patterns as well as the coefficient of variation for the 1951-1980 time period.

Most of south and central Saskatchewan averages between 325 and 400 mm of precipitation in a year. There are however two distinctly dry areas occurring in the Palliser Triangle which have annual averages of less than 300 mm. Eastern and northern portions of the province have average annual precipitation amounts of 425 to over 470 mm.

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INTRODUCTION

In recent years lack of precipitation has become a major concern. Many people appreciate knowing how much precipitation their area of the province is expected to receive, on average, in a year. Maps are a quick and easy way of obtaining a general figure. The previous mean annual precipitation map for Saskatchewan was published in 1969 in the Atlas of Saskatchewan (Richards and Fung 1969). The purpose of this report is to update that work for agricultural Saskatchewan. The updated map covers a time period of 1951 to 1980. A current general mean annual precipitation map is available (AES 1986), but it is unable to show sufficient detail in Saskatchewan because of its wide Canadian coverage. For many purposes a more detailed map is required and Figure 1 fulfils this requirement.

METHODOLOGY

The Saskatchewan Mean Annual Precipitation Map (Figure 1) was generated by selecting a set of climate stations, evenly located throughout the central and southern portions of the province. A total of 33 sites has been used on the map and many more were obtained to improve the spatial analyses. The precipitation amounts are an average for the 1951-1980 time period, and are rounded off to the nearest millimetre.

It is also useful to know an area's precipitation variability. A station may receive a mean annual precipitation amount over 400 mm but its coefficient of variation can be about 30%, e.g., Lintlaw. This demonstrates that the amount of precipitation a location receives can fluctuate greatly from year to year.

The Saskatchewan Variability of Mean Annual Precipitation Map (Figure 2) was generated by using the same sites and time period as the Saskatchewan Mean Annual

MEAN ANNUAL PRECIPITATION (mm) 1951-1980

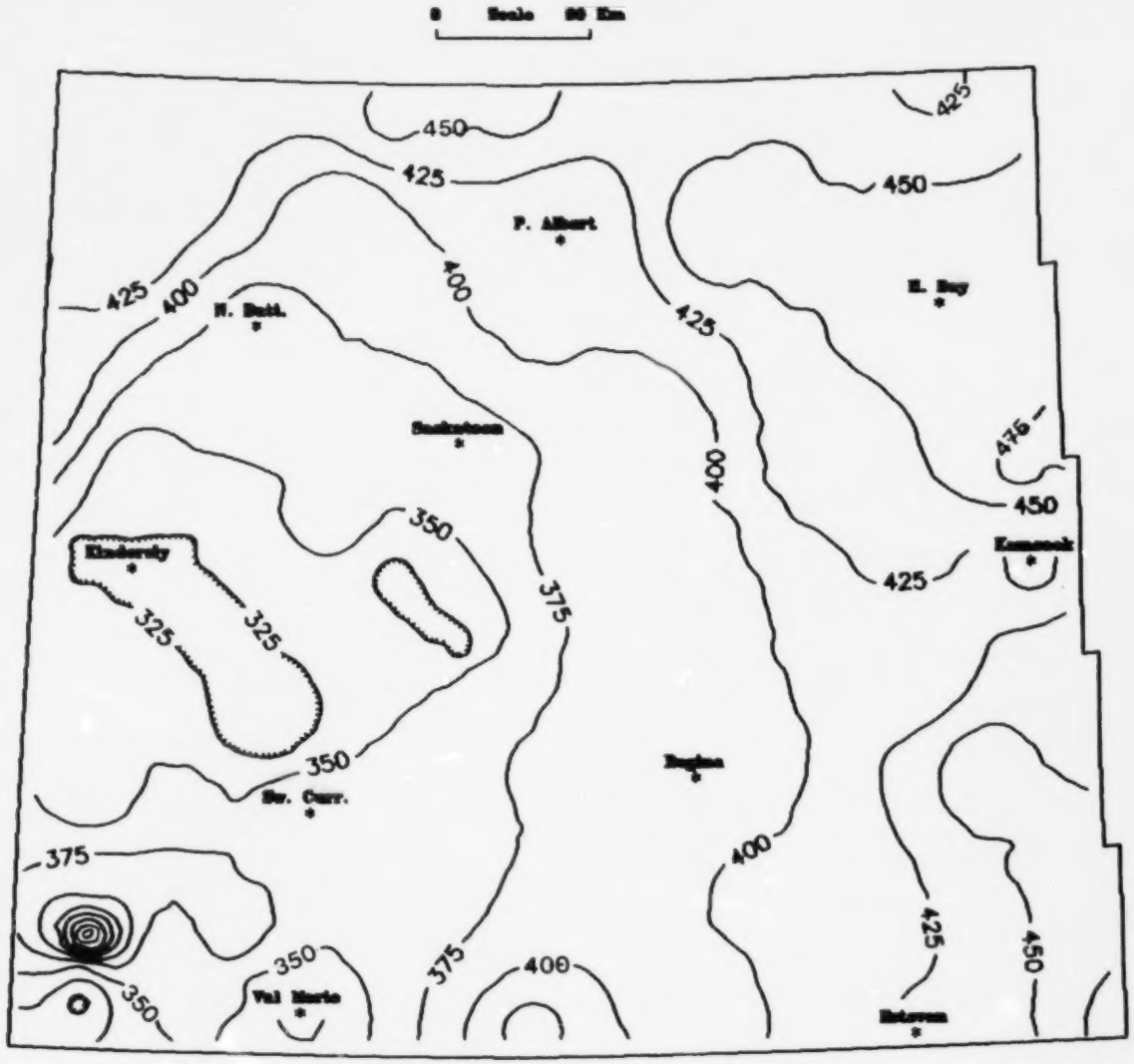

Figure 1.

VARIABILITY (%) OF MEAN ANNUAL PRECIP. 1951–80

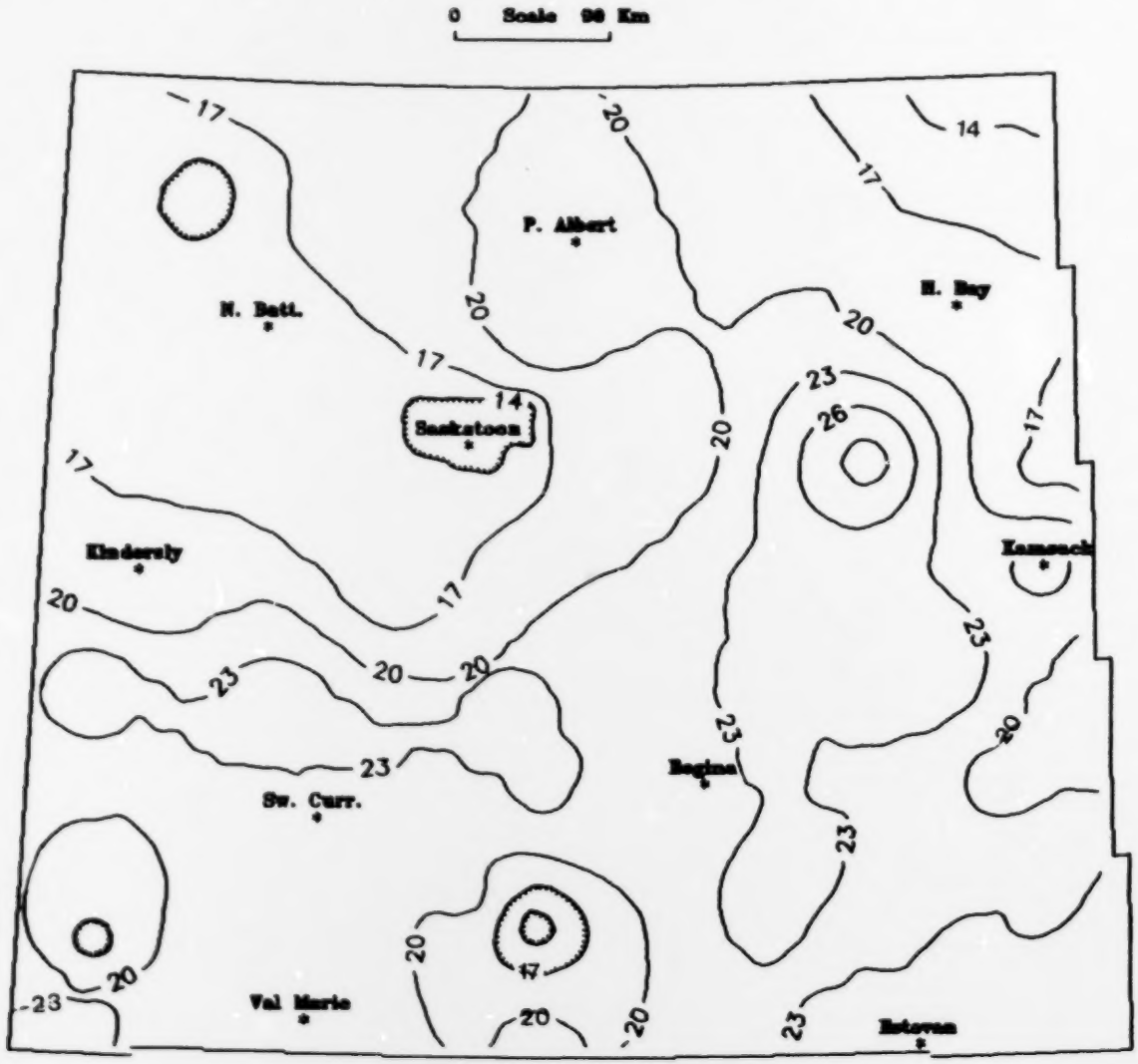

Figure 2.

Precipitation Map (Figure 1). The following formula was used: $CV = s/\bar{x}$, where CV is the coefficient of variation, s the standard deviation and $\bar{x}$ is the mean value for each site (Gray 1970).

Various data sources were also used as supplementary information (Figures 1 and 2). These include Atmospheric Environment Service (1982), Byfield (1984), Richards and Fung (1969), Dzikowski and Heywood (1990), Jones and Long (1989), US Department of Commerce (1974), Weir (1983), and Wheaton (1979). They were used to check general patterns and to compare study area border conditions.

DISCUSSION AND CONCLUSION

The Saskatchewan Mean Annual Precipitation Map (Figure 1) illustrates various characteristics and anomalies. The greatest average annual precipitation in agricultural Saskatchewan is located in the Cypress Hills Region in southwestern Saskatchewan. The Cypress Hills Park Station's mean annual precipitation is 529 mm. The areas with the second highest average rainfall amounts are eastern and northern Saskatchewan with values of 425 to over 470 mm in the Broadview area.

The majority of south and central Saskatchewan receives between 325 and 400 mm of precipitation in a year. There is also a general characteristic of greater annual precipitation in the eastern and northern regions of the province.

There are also two very distinctly dry areas in the province. The first is located in the Alsask region (west of Kindersley) where the mean annual precipitation is about 295 mm. Another distinctly dry area is south of the Cypress Hills. This area averages less than 300 mm of precipitation. These two dry areas are located in what is

known as the Palliser Triangle. This Alsask area is considered to be part of the Canadian "Dry-Belt".

The Palliser Triangle (including southwestern Saskatchewan and southeastern Alberta) has a rainfall variability in the summer from 35 to 40% (Trewartha 1981). For yearly variability, however, southwestern Saskatchewan ranges from 15 to 25% (Figure 2). The highest variability zones according to the 1951-1980 data, are in the Lintlaw (30%) and Estevan (27%) areas in the east central and extreme southeast parts of the study area.

Figures 3 and 4 illustrate the fact that most of the average annual precipitation is in the form of rain and, usually occurs during the summer months.

The reasons for the Canadian "Dry-Belt" and droughts are not clear but are often associated with certain synoptic climatic factors. The first is when a low level North Pacific High shifts further eastward than usual causing subsidence and drought. A second factor is the development of a quasi-stationary upper level ridge that causes a blocking effect. The block results in a shift in the jet-stream, cyclone tracks and associated boreal air masses northward (Hare and Thomas 1974; Trewartha 1981).

Mean annual total rainfall (mm) 1951-1980.

D: Dry. M: Moist. Areas delineated with letters have less (D) or more (M) rainfall than indicated on the dotted line enclosing them.

Figure 3.

Mean annual total snowfall (cm) 1951-1980.

D: Dry. M: Moist. Areas delineated with letters have less (D) or more (M) snowfall than indicated on the dotted line enclosing them.

Figure 4.

Source: University of Saskatchewan, 1987

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